Introduction: Reviews of Environmental Health, 2001

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Mixed feelings of excitement, anticipation, and concern marked the end of the last century and millennium. This was especially true in communication and information technology. Over the past 10 years there has been an exponential growth in these fields.

Rapid communication has become the norm for many people. In fact, if executives at Finland's Nokia Oyj are correct in their prediction, one billion people—just under a fifth of the world population—will own a cellular phone by the middle of 2002 (*1*). But has the availability of much faster and easier means of communication improved the level of understanding among people?

Information technology took root and grew rapidly during this period. There were high expectations that information technology would enhance the dissemination of information, raise the educational level of society, and have a positive impact on our quality of life. There is no doubt that the availability of information has increased dramatically. But has this availability of information really increased the educational level of our society?

The rapid growth and concomitant increased dependence on technology left our high-tech society vulnerable to electronic mischief and the so-called Year 2000 (Y2K) bug. The numerous mischievous attacks on the Internet have led to increased surveillance and development of protective software to ward off electronic attacks. Feverish preparations were made to avert a seemingly imminent disaster posed by the Y2K bug. In the end, the first day of the year 2000 came and went with only minor problems. Does this mean the preparations paid off, or was the problem overstated? In any case, our high-technology world was little affected by the "bug."

The global economy around the world responded in kind when fueled by the expanding technology sector. The United States–based, technology-heavy Nasdaq stock index reached a new high in the last couple of years but then took a nose dive. The technology bubble burst.

In the case of the environment, information technology provides a means for many people to access and explore environmental issues. However, many of the goals to protect our environment have not been reached. During the Earth Summit held in Rio de Janeiro, Brazil, in 1992, daily updates on the progress of the conference were readily available. One of the most important accomplishment of the Summit—the signing of the Framework Convention on Climate Change—was reported rapidly around the world, as was the agreement to limit greenhouse gas emissions by developed countries, announced five years later in Kyoto, Japan (Kyoto Protocol) (*2*). But as of this date, the Kyoto Protocol has not been ratified by many of the larger nations. On the other hand, progress has been made and, even more important, the level of awareness of environmental issues is at an all-time high, thanks partly to the ready access to environmental news over the Internet. Other positive signs for the protection of the environment are actions taken by some of the large oil companies. For example, Royal Dutch/Shell Group and British Petroleum are investing in research in alternative energy sources and in renewable energy sources (solar power, wind turbine, and fuel cells). Use of nonpetroleum energy sources could make it easier for nations to reduce the emissions as mandated by the Kyoto Protocol. Efforts to sequester CO_2 in deep aquifers are also underway, including the $20 million CO_2 Capture Project (*3*). One must believe that at least part of this change in attitude and policy direction is related to the information revolution.

Apart from the impact of information technology, the emergence of the "precautionary principle" to influence the formulation of environmental regulations is another important development. The principle states that "when an activity raises threats to the environment or human health, precautionary measures should be taken, even if some cause-and-effect relationships are not fully established scientifically" (*4*). The importance of this principle has been emphasized in *EHP* editorials (*5,6*). Earlier implementation of this concept might have ameliorated some of the damage to the environment as well as the suffering of many people. How much better would our environment be had the precautionary principle been exercised when pesticides and insecticides were first introduced into the agriculture industry on a massive scale?

Environmental Health Perspectives was one of the first journals to take advantage of information technology for imparting environmental knowledge. In 1997, *EHP* developed an Internet site: Environmental Health Information Service (*7*). At this site, a broad variety of news and scientific information on the environment and human health is readily available. Also, *Environmental Health Perspectives* is available in its entirety to subscribers, and abstracts of news and scientific articles are free to the general public.

As has been our practice, this year's *EHP* annual review issue contains articles on topics chosen to cover a broad area of environmental health. The articles provide updated information for specialists and transfer information across other disciplines. The objectives of the reviews are to summarize new developments in environmentally relevant areas, to provide a perspective for the new findings, and to provide sufficient background information for those not familiar with the specific topic. Selected topics for this edition are endocrine disruption, chemical toxicology, developmental neurotoxicology methods, and global environmental and public health issues.

Endocrine Disruption

A finding that has received much attention over the last several years is that certain chemicals can act as estrogen mimics or can act to disrupt other endocrine systems. Concerns about environmental substances with hormonal actions have generated scientific debate about the risks they pose for human and wildlife health. *Environmental Health Perspectives'* coverage of this important topic continues in this year's annual review issue. Whitten and Patisaul (*8*) provide a comprehensive review on the physiology and pharmacology of phytoestrogens (plant estrogens) in a variety of species, including humans. The authors compile animal and human data on biological effects and exposure concentrations of phytoestrogens to identify fruitful areas for future research. The possible existence of a threshold effect for endocrine disruptors is another area we sought to address. Brucker-Davis et al. (*9*) provide a timely and thought-provoking review of the impact of hormonal changes within normal physiological ranges on development, the role of stresses on hormonal status, and the various states of borderline hormonal imbalance. The authors question the existence of a threshold effect and conclude that even mild perturbations of different endocrine systems may be significant.

Chemical Toxicology

Understanding the underlying mechanisms of environmentally induced disease is critical

when developing strategies to minimize the effects. An area of toxicology that is relatively untouched is that of the mechanisms of cardiotoxicity resulting from exposure to environmental toxicants. Kang (*10*) gathers important information about cellular events, signaling pathways, and molecular mechanisms that can be affected by environmental toxicants, resulting in myocardial toxicologic responses.

A program designed to address the relationship between environmental risks and breast cancer was initiated in 1995 by Cornell University. The goals of the Program on Breast Cancer and Environmental Risk Factors (BCERF) are to translate scientific findings and data into understandable and accessible information and to develop risk reduction strategies. Suzanne Snedeker, the research project director of BCERF, has provided a necessary and timely review of a controversial and fascinating topic: the possible role of pesticides in the development of breast cancer, specifically, here, DDT and dieldrin (*11*). Another group of halogenated compounds is of interest because of an alarming time trend toward increasing concentrations of polybrominated diphenyl ethers (PBDEs) found in human breast milk. Darnerud et al. (*12*) present a review of the chemistry, environmental fate and transport, residue concentrations, toxicokinetics, toxicology, and human health effects of PBDEs. These important chemicals are used as flame retardants in plastics and in textile coatings, and are bioaccumulated and magnified in the environment. This review should serve as a valuable reference article because it is an updated version of the 1998 Nordic Council of Ministers Report on PBDEs.

Ethnomedicine has become an increasingly important topic as more people, including those in developed nations, begin to explore alternative medical treatments. The NIEHS sponsored an international meeting in 1998 to evaluate the research needs on the use and safety of medicinal herbs. This area strays somewhat from *EHP*'s usual areas of interest. However, use of herbal products is a case of self-selected exposure to potential environmental toxicants (*13*). Fabricant and Farnsworth (*14*) were invited to review the different methods for discovering new drugs from plants, especially through information gained from human experiences.

Developmental Neurotoxicology Methods

The U.S. Environmental Protection Agency (EPA) is reassessing its standardized protocols for evaluating developmental neurotoxicology used in human health risk assessment. The International Life Sciences Institute (ILSI) Risk Science Institute (RSI) entered into a cooperative agreement with the U.S. EPA to evaluate proposed changes. Because of the growing awareness of the effects of toxicants on the nervous system, *EHP* considers these issues important and has included four review papers developed from the working group convened by ILSI–RSI. In these papers, the authors identify and describe methods to detect and characterize developmental neurotoxicity in laboratory animal in the areas of behavioral testing, neuropathology, and pharmacokinetics (*15*–*18*).

Global Environmental and Public Health Issues

The complexity of the literature has been a stumbling block in the development of risk assessments. As global agreements on toxicants are being negotiated, data must be correlated from a range of scientists working in many fields including soil and water sampling, air pollution monitoring, toxicologic studies, epidemiologic studies, and public health evaluations. Jorgenson's article (*19*) should prove extremely useful as a guide for others intending to develop risk assessments. Her article concentrates on the databases that are available for aldrin and dieldrin and represents ways to find similar data on other toxicants.

Climate change has been proposed as a major threat to environmental health, and some investigators suggest it is a deciding factor in the prevalence and geographic distribution of infectious disease. Reiter (*20*) has reviewed the case for malaria, yellow fever, and dengue and concludes that climate is not a deciding factor compared to such parameters as demographics, housing, agricultural practices, and human behavior. This controversial viewpoint should interest professionals in environmental health. One reviewer referred to the article as "an erudite paper that will make a substantial contribution to the debate over climate change effects on infectious diseases and the field of environmental health in general."

Phytoremediation can be effective at sites contaminated with organic or metal pollutants; however, there has been more discussion of its potential than actual use of the technology. In phytoremediation, a plant accesses the pollutants by its roots and sequesters, degrades, immobilizes, or metabolizes the pollutants in place. Because of the potential a natural method for remediation offers, we asked Dietz and Schnoor (*21*) to present an updated review of a remediation method that uses vegetation for *in situ* treatment of contaminated soils, sediments, and water.

EHP will continue to embrace the information technology revolution in the hope that our efforts will contribute to the scientific growth of environmental health scientists and to the general public's appreciation of the importance of environmental issues to human health. The editors hope that these reviews will provide our readers with the broad range of topics that keep the environmental community enlivened and eager to address new areas in their own research.

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